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Description of a new subspecies of *Mesapia peloria* from central Nepal, and taxonomic notes for other subspecies (Lepidoptera, Pieridae)

Teruo TADOKORO[1)], Yuichi KOIDE[2)] and Katsuhiko HORI[3)]

[1)] 7-5-35 Kinuta, Setagaya-ku, Tokyo, 157-0073 Japan
[2)] 4813-1, Sakura-machi, Numata-shi, Gunma, 378-0052 Japan
[3)] 5497-1, Toyoshina, Azumino-shi, Nagano, 399-8205 Japan

Abstract Based on distinct morphological characteristics and habitat isolated from other subspecies, *Mesapia peloria epsteina*, a new subspecies of *M. peloria* (Hewitson, 1853) from central Nepal, is described and illustrated.

Key words *Mesapia peloria epsteina* ssp. nov., Morphology, Systematic, Taxonomy.

Introduction

Pieris peloria Hewitson, 1853 was described with very vague type locality as 'Mts of Chinese Tartary', which covers almost the whole area of West China, including Tian-shan Mts and Qilian-shan Mts. The genus *Mesapia* Gray, 1856 was described with this butterfly as type species, distinguished from the genus *Aporia* by smaller and more rounded wings and hairy genitalia. Without knowing the genus *Mesapia*, Alphéraky (1887) described *Aporia lama* from NE Tibet, which should have been described as *Mesapia peloria lama*. But soon afterwards, Alphéraky (1889) agreed that *Aporia lama* was the same species as *M. peloria*. However, the vaguely described type locality 'Mts of Chinese Tartary' and mixed use of old and new venue names for the type localities later caused confusion about local subspecific taxa.

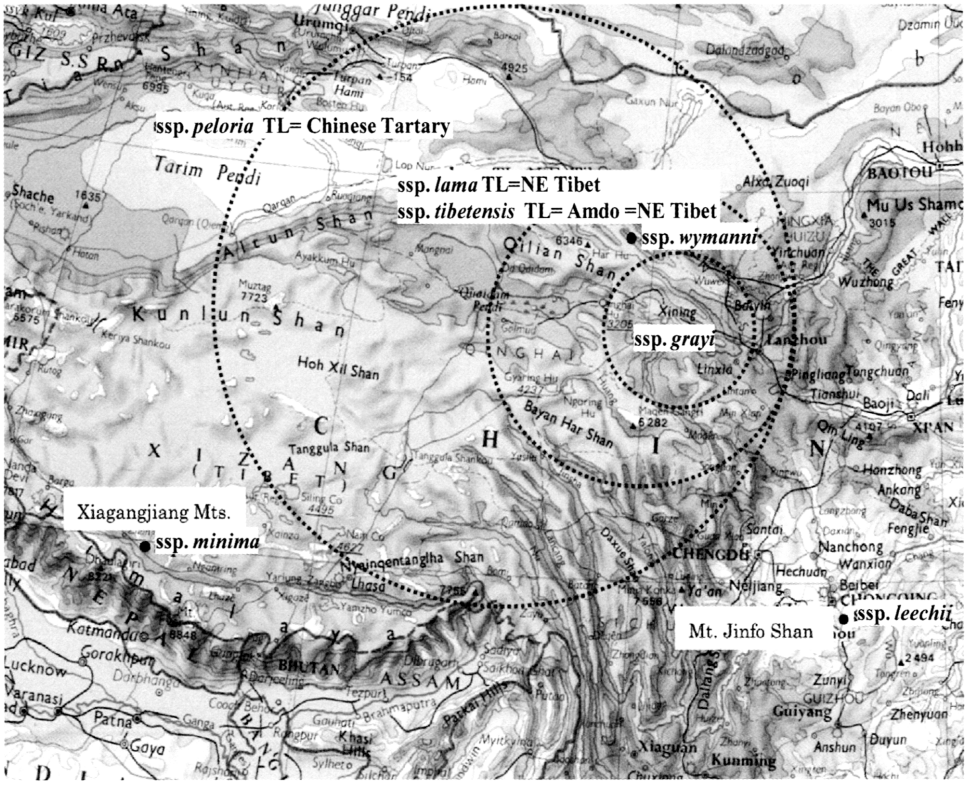

Fig. 1. Type localities of local forms of *M. peloria.*

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Both ssp. *grayi* from Qilian-shan Mts [West of Lanzhou (alt. 3,000m) within a part of NE Tibet], and ssp. *leechi* from Ginfu Shan in Sichuan prov., China were described by Bang-Has (1934). Subspecies *tibetensis* D'Abrera, 1990 was described from 'Amdo' [an old Tibetan province, most of which is incorporated in current Qinghai province in NE Tibet]. Subspecies *minima* Huang, 1998 was described from SW Tibet in the Xiagangjiang Mts (alt. 4,800-5,200m), and ssp. *wymanni* Ziegler, 2007 was described from the north slope of NW Qilian-shan Mts (alt. 3,600-4,000m). Figure 1 indicates the type localities of all local subspecific taxa of *M. peloria*, hitherto described. Although some authors include *M. peloria* into the genus *Aporia*, we treat this butterfly as belonging within a separate genus *Mesapia* in this paper as indicated by Gray (1856).

Recently, we reviewed our own specimens of *M. peloria* collected from several places some years ago and found that the one from central Nepal might be a new subspecies. We studied the history of *M. peloria* and observed morphological characteristics in every detail.

Historical review

In the 20th Century, both Röber (1906) and Verity (1905-1911) treated specimens from NE Tibet [ssp. *lama*] as the nominotypical form of *M. peloria*, based on the understanding that ssp. *lama* Alphéraky (1887) was the same species as *M. peloria*, agreed by Alphéraky (1889) himself. In fact, Qilian-shan Mts in NE Tibet were sometimes called 'Mts of Chinese Tartary' and a known site for *M. peloria*. Furthermore, no subspecies had been described by that time. In the 21st Century, Della Bruna *et al.* (2004) reviewed *M. peloria*, and selected 4 subspecies based on the following morphological characteristics and type localities. 1) ssp. *peloria* (incl. ssp. *lama* and ssp. *tibetensis* from NE Tibet as synonyms) - The nominotypical form of *M. peloria* from Mts of Chinese Tartary. 2) ssp. *grayi* - From Qilian-shan Mts in Gansu [a part of NE Tibet], but large in size, fw and hw discal spots prominent. 3) ssp. *leechi* - From Mt. Ginfu-shan in Bango in Sichuan, dark colored and geographically isolated. 4) ssp. *minima* - From SW Tibet, small in wing size and geographically isolated. On the other hand, Ziegler (2007) had different opinions and re-selected 4 subspecies. 1) ssp. *peloria* (incl. ssp. *leechi* as synonym) - The nominotypical form from East Qilian-shan Mts and Sichuan. 2) ssp. *lama* (incl. ssp. *grayi* and ssp. *tibetensis* as synonyms) - From West Qilian-shan Mts and N. Tibet including areas such as Burnbudai-shan and Bayanhar-shan, with a distinct black discal spot in the hindwing upperside cell. 3) ssp. *minima* - From SW Tibet with smallest wing size. 4) ssp. *wymanni* - From north slope of NW Qilian-shan Mts, with pink-orange ground color. Ziegler (2007) is the first entomologist who revised the taxonomic position of ssp. *lama* from a synonym of ssp. *peloria* to a distinct local subspecific taxon.

As for the Himalayan population, Epstein (1979) introduced *M. peloria* ssp. from Charkabot (28.46N-83.55E, H=4,000-4,400m) occurring from 3 to 18 June, and considered that the butterfly was at least a subspecies of *M. peloria*. But, he made no formal description of this butterfly. Although Epstein (1979) did not show the features of the butterfly, we consider that ssp. *epsteina* is the same butterfly as the one that Epstein (1979) introduced.

Materials and methods

Specimens of newly described *Mesapia peloria epsteina* (Figs. 2 & 3-A) are from central Nepal. The figures of *M. peloria* ♂ (Fig.4) were referred to Hewitson (1853). The photographs of the type specimens of ssp. *peloria* ♀ (Fig. 5), ssp. *grayi* (Fig. 6) and ssp. *tibetensis* (Fig. 7), deposited in the NHM (BMNH) collectively, were referred to Ziegler (2007). The photograph of ssp. *wymanni* ♀ (Fig. 8) was referred to Ziegler (2007). The figures and photographs of ssp. *lama* (Fig. 9) were referred to Röber (1906) and Verity (1905-1911). Male genitalia were dissected and observed by stereomicroscope at 20 magnifications after removing skins and muscles by 20% KOH solution (Fig. 10). Three other local forms of *P. peloria* are shown and illustrated. They are from central Tibet at Damxung, Tibet Autonomous Reg. (Alt. 4,000m) collected on the 6th July (Fig. 3-B), from Sichuan Prov. at Xiaojin (Alt. 4,500m) collected on the 2nd July (Fig. 3-C) and from Qinghai Prov. at Ngola-shankou (Alt. 3,620m) collected on the 28th June (Fig. 3-D). All venues are indicated in Figure 11.

Results

Description

Mesapia pelorisa epsteina Tadokoro, Koide & Hori, **ssp. nov.** (Figs 2, 3-A)

Holotype ♂, Jarchuk Kang, Dolpo Reg. (Alt. 4,500m), central Nepal, 30 VI - 4 VII, 1981; Paratypes 50 ♂, same label as holotype, Paratypes 8 ♀, same label as holotype, Paratypes 4 ♂. Khumba, Dolpo Reg., central Nepal, 30 VI 1981, Paratypes 5 ♂, Bharebu, Dolpo Reg., central Nepal, 02 VII 1981. (Holotype specimen will be deposited in the University Museum of the University of Tokyo, and paratype specimens will be deposited in

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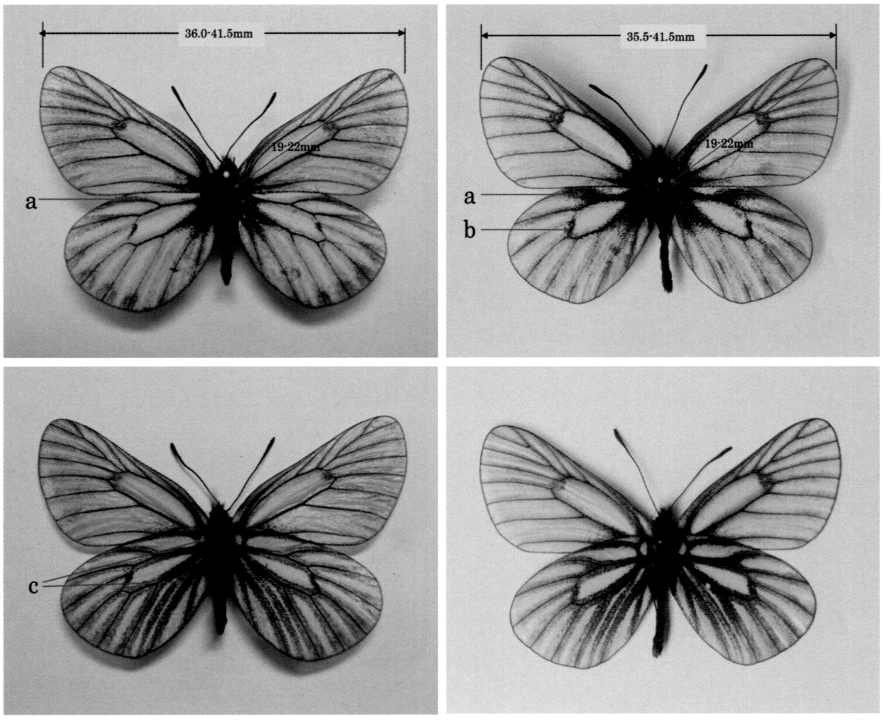

Fig. 2. *Mesapia peloria epsteina* ssp. nov. Left ♀ & Right ♂.

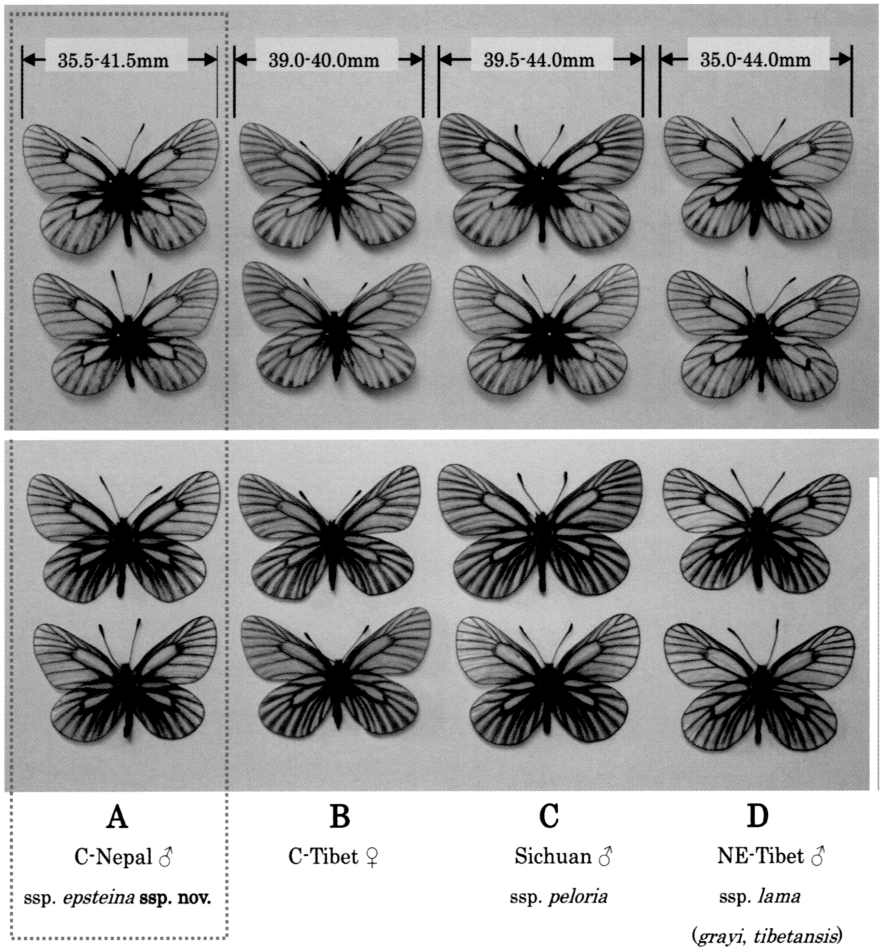

Fig. 3. Local forms of *M. peloria.*

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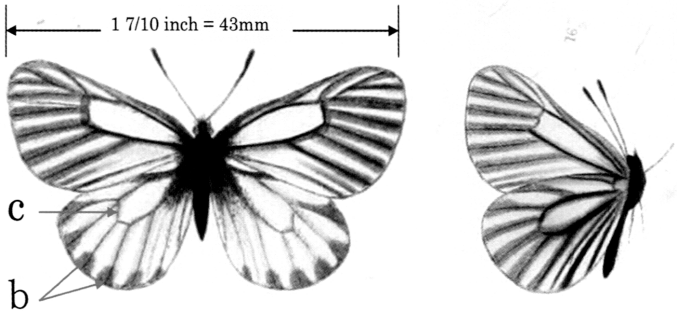

Fig. 4. *M. p.* ssp. *peloria* ♂ (After Hewitson, (1853)).

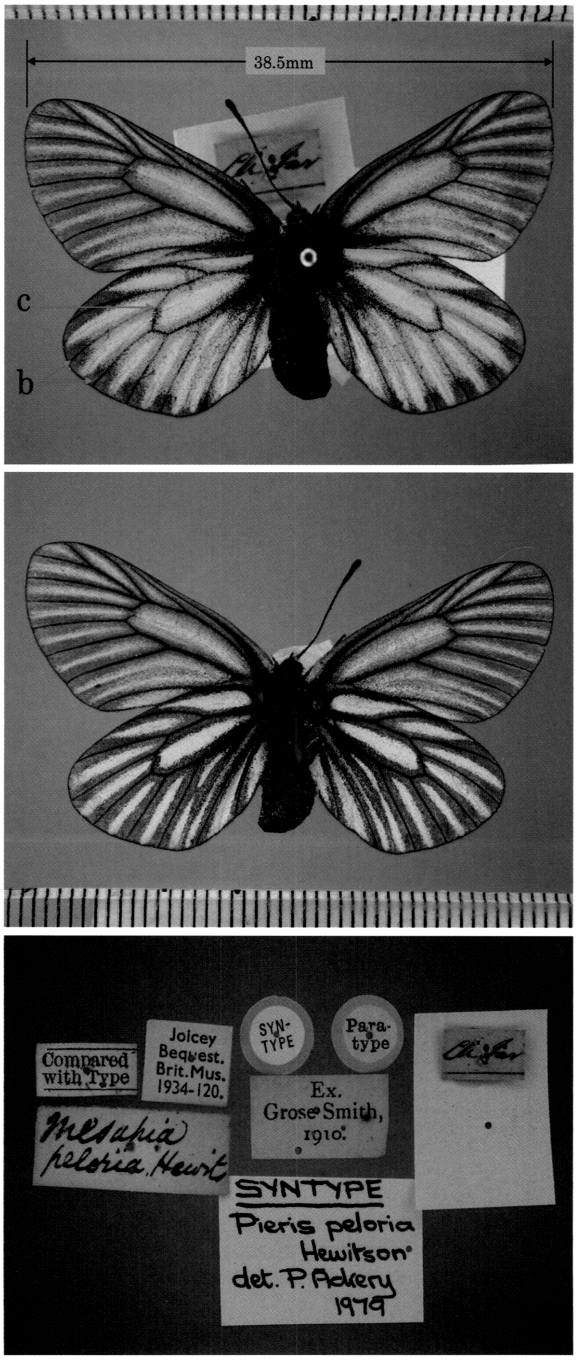

Fig. 5. *M. p.* ssp. *peloria* ♀ - Type specimen ©NHM, London.

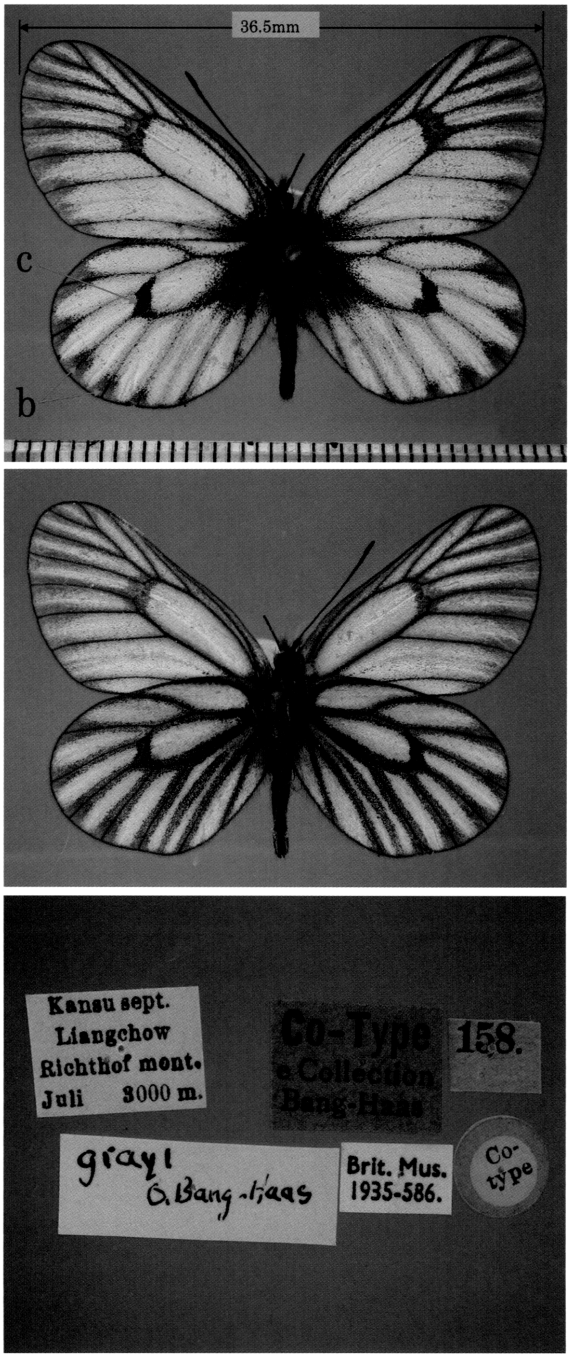

Fig. 6. *M. p.* ssp. *grayi* ♂ - Type specimen ©NHM, London.

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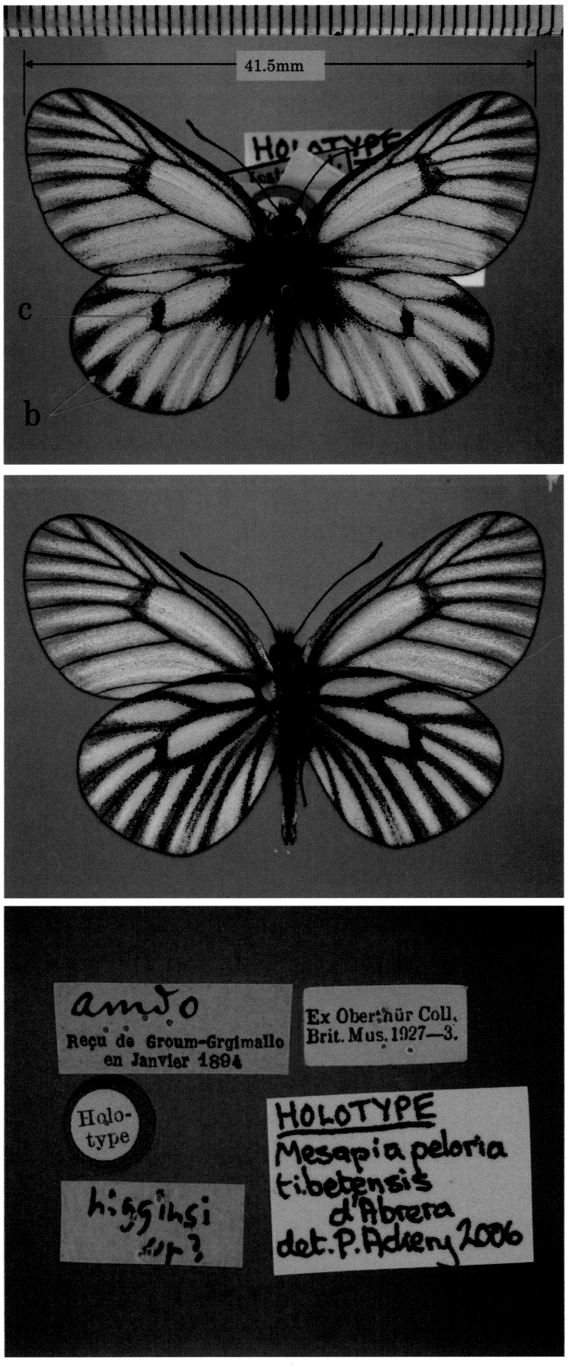

Fig. 7. *M. p.* ssp. *tibetensis* ♂ - Type specimen ©NHM, London.

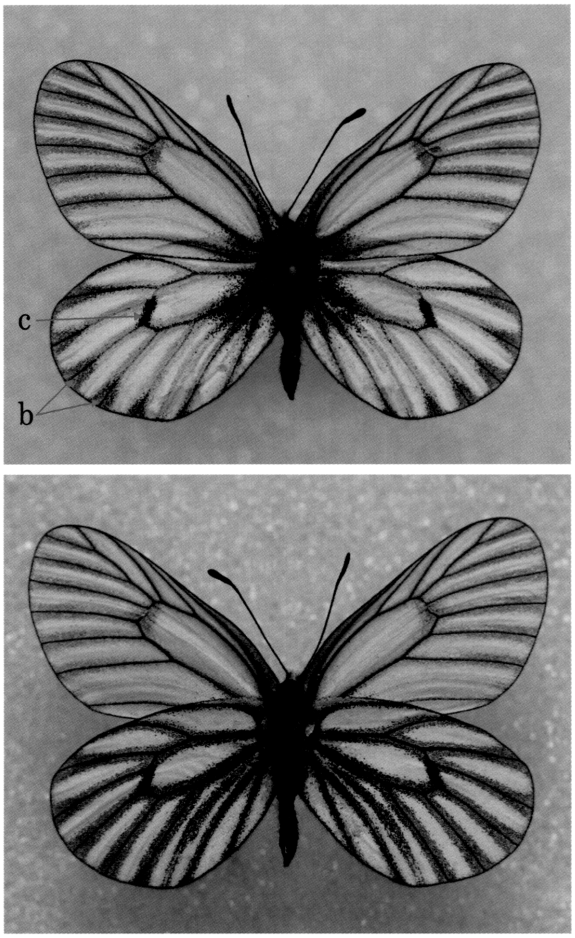

Fig. 8. *M. p.* ssp. *wymanni* ♀ - Type specimen (After Ziegler 2007).

the Research Institute of Evolutionary Biology in Tokyo, South China Agricultural University in Guangzhou and NHM in London.)

Wing expanse: 35.5 - 41.5mm in males and 36.0 - 41.5mm in females.
Forewing length is 19-22mm in males and 19-22mm in females.

Wing markings (in male): Wings milky white with blackish along veins. Basal area black. Marginal area almost transparent. Hindwing subcostal vein and vein 7 thickly suffused by black scales (a). Hindwing cubital vein suffused by black scales but black spot at the end of cell not as prominent as in ssp. *lama*, ssp. *grayi* or ssp. *tibetensis* (b).

Ground color of forewing underside pale yellow,

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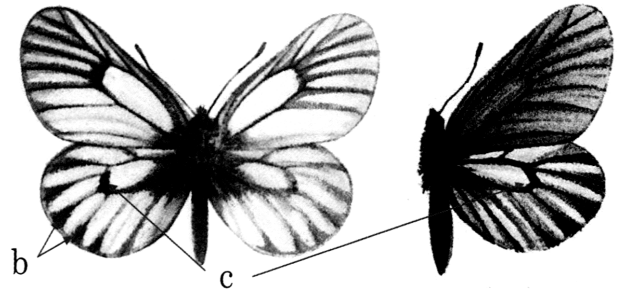
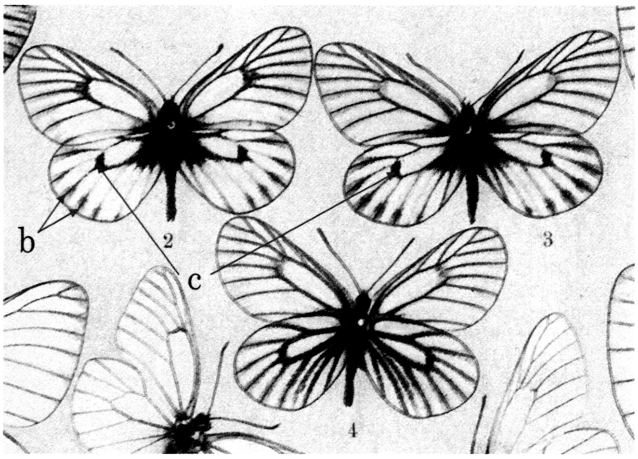


After Röber (1906) ♂ (LL: Upperside, LR: Underside), ♀ (R: Upperside)



After Verity (1905-1911) ♂ (2), ♀ (3), Underside (4)

Fig. 9. *M. p.* ssp. *lama* ♂&♀(After Röber, 1906 and Verity, 1905-1911).

hindwing underside canary yellow. Underside basal spots of spaces 1 and 8 orange yellow. Body black with long and black antenna.

Wing markings (in female): Forewing upper side orange tinted with the venation brownish. Hindwing subcostal vein and vein 7 are not as thickly suffused by black/dark brown scales as in males (a). Ground color of forewing underside slightly orange tinted, hindwing underside pale white with space 1 and basal spot of space 8 orange yellow (c).

Male genitalia: Tegumen round (a), uncus cranked (b), valva not projected posteriorly as in ssp. *peloria* (c), vinculum short (d). (Fig. 10-A)

Type locality: Jarchuk Kang, Dolpo Reg. (Alt. 4,500m) in central Nepal (Fig. 11-A),

Habitat: South slope of Himalayas. [W. Nepal to Bhutan, 2400-4,500m, moist banks, alpine slopes, Epstein (1979)]
Season of occurrence: A single generation occurs in June to early July.
Food plant: *Salix fructiculosa* - Epstein (1979)

Etymology

The subspecific name "*epsteina*" is derived from Hans J. Epstein who introduced this butterfly in his paper "Interesting, rare and new Pierids (Lepidoptera: Pieridae) from the central Nepal Himalayas" in 1979.

Remarks

The following morphological characteristics are indicated in comparison with other subspecies.

Wing markings (Fig. 3):

Hindwing subcostal vein and vein 7 thickly suffused by black scales, which differs from other subspecies. Hindwind cubital vein suffused by black scales but black spot at the end of cell not as prominent as in ssp. *lama*, ssp. *grayi* or ssp. *tibetensis*.

Male genitalia (Fig. 10):

1) Tegumen somewhat rounded in lateral aspect and not as straight as ssp. *peloria* or ssp. *lama*. 2) Uncus cranked in almost 100 degrees, while both ssp. *peloria* and ssp. *lama* bent only about 150 degrees. 3) Valva is not markedly projected as in ssp. *peloria*. 4) Vinculum is shorter than ssp. *peloria* and ssp. *lama*.

As for the habitat, ssp. *epsteina* is distributed on the south side of the Himalayas, while ssp. *peloria* and ssp. *minima* are on the north side (Fig. 11). Although *M. peloria* inhabits the high elevation of mountains ranging from alt. 2,400m to 5,200m, the peaks of the Himalayas separate ssp. *epsteina* from ssp. *peloria* and ssp. *minima*.

Discussion

Intraspecific variations

Other than ssp. *epsteina*, we examined some local forms of *M. peloria* (Fig. 3: B-D) in the collection of the co-authors, which were from four different places (Fig. 11: B-D). Comparing their wing markings with the figures and photographs of the type specimens (Figs 4-9), it is indicated that:

Specimen C (♂) from Sichuan Prov. (Fig. 3-C) perfectly matches with ssp. *peloria* (Fig. 4) in wing markings. We therefore identify specimen C as ssp. *peloria*. We believe that D'Abrera (1990) considered that the type locality of *M. peloria* was Ta Tsien Lu (former name of Kangding in Central Sichuan) for the same reason. Ziegler (2007) also agreed that the specimen from Sichuan belonged to

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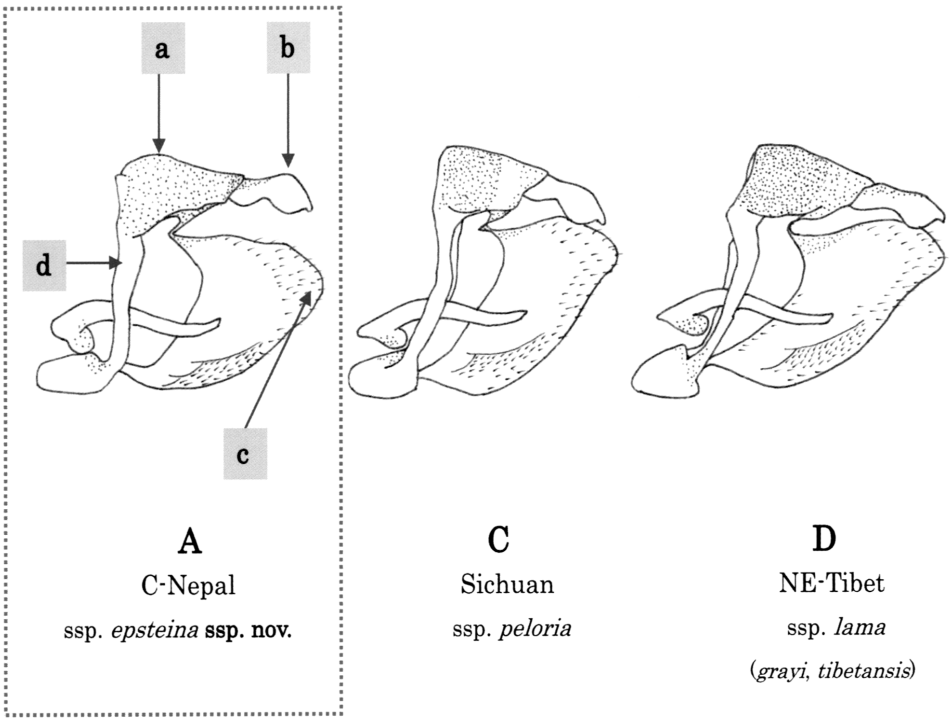

Fig. 10. Male genitalia of *M. peloria.*

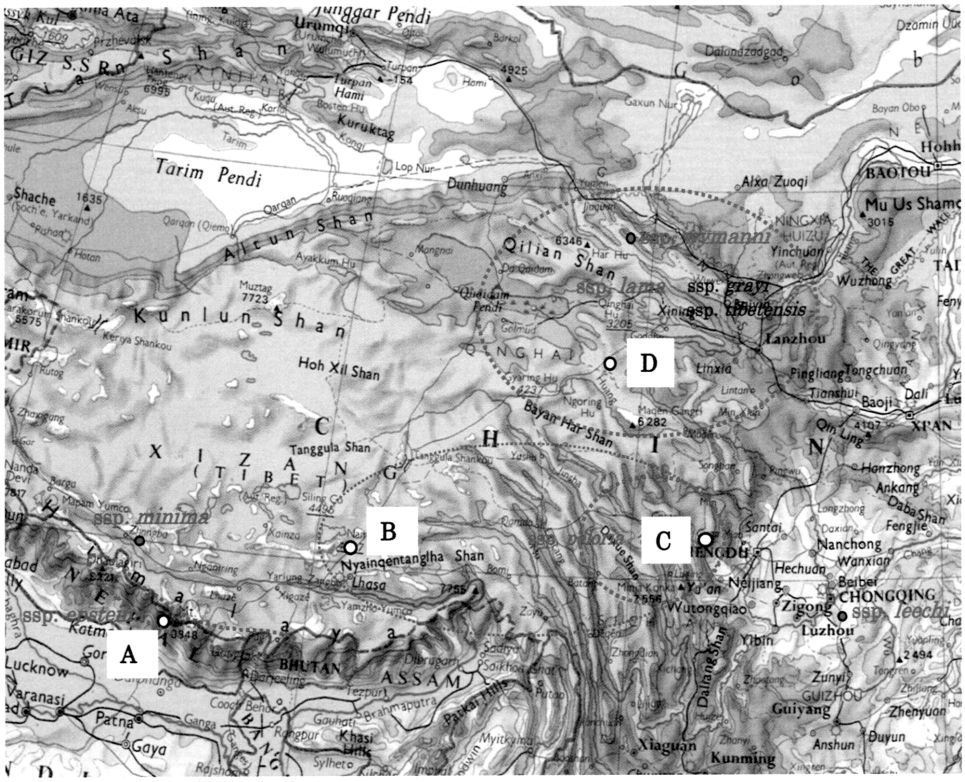

Fig. 11. Distribution of local forms of *M. peloria.*

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ssp. *peloria*. Since the type locality of *M. peloria* as 'Mts of Chinese Tartary' covered too vast an area, we cannot locate the specific venue. We infer that ssp. *peloria* may not be from Qilian-san Mts in N. E. Tibet but from somewhere in the Tibetan mountains, which might be included in an omnibus sense in 'Mts of Chinese Tartary' in the 19th Century.

Specimen D (♂) from Qinghai province (Fig. 3-D) resembles ssp. *lama* (Fig. 9), ssp. *grayi* (Fig. 6) and ssp. *tibetensis* (Fig. 7), with a prominent black discal spot in the cell (c). We agree with Ziegler (2007) that ssp. *grayi* and ssp. tibetensis are synonyms of ssp. lama, and identify specimen D as ssp. *lama*. At the same time, we confirm that ssp. *lama* (Fig. 9) is not a synonym of ssp. *peloria* (Figs 4, 5) as indicated by Ziegler (2007).

Specimen B (♀) from central Tibet (Fig 3-B) resembles ssp. *peloria* (Fig. 5) in wing markings, with triangular marginal markings (b) and no black discal spot in the cell (c). But the ground color of forewing upperside and both wings underside are orange tinted as in the ssp. *wymanni* (Fig. 8). We cannot identify this butterfly at this moment, as we have not observed a male specimen.

Taxonomic notes on other local forms

Other than ssp. *peloria*, ssp. *lama* (incl. ssp. *grayi* and ssp. *tibetensis*) and newly described ssp. *epsteina*, the following local subspecific taxa remain:

ssp. *leechi*: We agree with Della Bruna *et al.* (2004) that ssp. *leechi* could be a distinct local subspecific taxon if its type locality of Mt. Ginfu-shan in Sichuan is the same venue as Mt. Jinfo shan in Chongqing (peak alt. 2, 251m, and used to be a part of Sichuan) as indicated by Della Bruna *et al.* (2004). D'Abrera (1990) and Ziegler (2007) considered that ssp. *leechi* is a synonym of ssp. *peloria*. The figure or photograph of the type specimen of ssp. *leechi* was not found.

ssp. *minima*: Although wing markings resemble those of ssp. *peloria* (Figs 4, 5), wing size (LF) is as small as 12.5~18mm.

ssp. *wymanni* (Fig. 8): We agree with Ziegler (2007) that the ground color of forewing and both wings underside are pink-red and stable, especially in the female.

Range

Fig. 11 shows the distribution map for all local subspecific taxa of *M. peloria*, drawn based on Della Bruna *et al.* (2004), Ziegler (2007) and our own investigation. The specimen from central Tibet is still unidentified at this moment. We need further study to identify it.

The ranges of local forms [subspecies] are concluded as follows:

ssp. *peloria*: nominotypical form from the Tibet Mts.

ssp. *lama*: discal spot in hw upperside cell prominent, from N. E. Tibet.

ssp. *grayi* and ssp. *tibetensis* are considered as synonyms of ssp. *lama*.

ssp. *leechi*: from Sichuan, but may be a synonym of ssp. *peloria*.

ssp. *minima*: small wing expanse from the north side of Mts Himalayas.

ssp. *wymanni*: orange morph in female, from N. W. Qilian-shan.

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摘 要

中央ネパール産メサピアシロチョウ*Mesapia peloria*の新亜種記載とその他の亜種に関する覚え書き（田所輝夫・小出雄一・堀　勝彦）

中央ネパールのヒマラヤ高山地帯で1981年6月30日～7月4日に採集された*M. peloria*の個体群を精査したところ，斑紋や♂交尾器（Fig. 10）に形態的な特徴が認められかつ地理的地形的な隔絶が示唆された事から，中央ネパールDolpo地区Jarchuk Kang（標高 4,500m）をタイプ産地として新亜種*Mesapia peloria epsteina*（和名：エプステイン・メサピアシロチョウ）を記載する(Figs 2, 3-A). 亜種名*epsteina*は1979年にこの蝶を最初に世界に紹介したH. J. Epsteinの功績を讃えて命名するものである. なお, 同亜種の記載を通して*M. peloria*の各地方型亜種の形態的変異を再検討した. 四川省高山帯産 (Fig. 3-C) の個体群はssp. *peloria* (Figs 4, 5), 青海省産 (Fig. 3-D)のそれはssp. *lama* (Fig. 9)とそれぞれ同定した. ただし中央チベット産 (Fig. 3-B) の個体は♀のみであり, ssp. *peloria*に似ているもののこの段階での同定は控えた. 我々は, Ziegler (2007)と同様に形態的特徴及びタイプ産地からssp. *grayi* (Fig. 6) 及びssp. *tibetensis* (Fig. 7) はssp. *lama* (Fig. 9) のシノニムであると考える一方で、ssp. *lama*自体はssp. *peloria* (Figs 4, 5) のシノニムではなく北東チベットに広く分布する地方型（亜種）であると考える. 逆に名義タイプ亜種であるssp. *peloria*は, これまで考えられてきたように北東チベットではなく, 四川省西部から中央チベットにかけて分布する個体群ではなかろうかと推測する (Fig. 11).

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